Co-composting of pig slurry with green wastes to prevent environmental impact of pig production in the Wallis archipelago, Pacific Ocean

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Photo 1. Pig slurry is not recovered and is a threat for the surface sheet of water.

In the middle of the Pacific ocean, Uvea, the principal island of the archipelago of Wallis covers 75 kmÇ with 10,070 inhabitants. Pigs are present in 67% of the Wallisian households and there would be more than 19,700 pigs on the island. The strong human and animal densities in the coastal fringes are a threat for the water resources which come exclusively from a surface sheet of water supplied with the infiltration of the rains. To act on the limitation of the pollution generated by the pig farms, the local Authorities decided to study the principle of co-composting pig slurry with green wastes.

Materials and methods

Photo 2. Green waste windrow.

- Shredded green waste (tree cutting and lawn mowing), used as a bulking agent, is mixed with pig manure coming from a farm.
- First step: to determine the characteristics of a saturated mixture of green waste with pig slurry.
- Second step: to test the composting performances of the liquid/solid mixture were tested using pilot-scale windrows.

? One windrow (W1) turned 6 times along the active fermentation phase with pig slurry addition for the first four turns. Total pig slurry addition during composting accounted for 60% of the quantity of pig slurry adsorbed in the initial mixture,

? The second one (W2) also turned at the same time, but without pig slurry addition

Results

First step

- Very diluted pig slurry with a dry matter content (DM) of 15 g.kg-1, due to local practices (frequent pig washings).
- Shredded green waste with a mean DM content of 557 g.kg-1.
- Adsorption capacity at saturation, expressed as liquid vs. solid fraction: 3.0 g.kg-1.
- Suspended matter of the pig slurry retained in free spaces of green waste; DM retention: 0.74 kg.kg-1 DM green waste.
- Characteristics of the mixture:

? water content: 78%

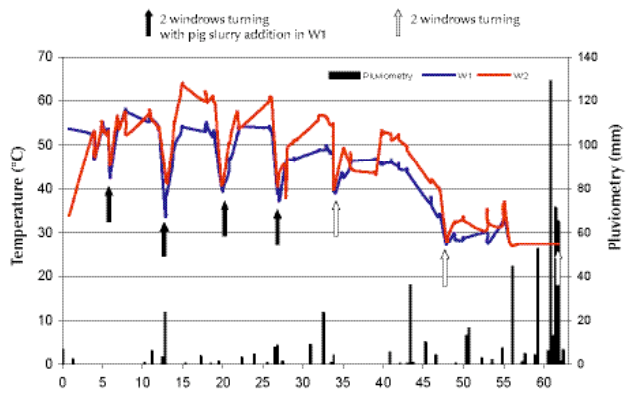
? wet bulk density: 829 kg.m-3

? calculated free air space: 25% (v/v)

To improve oxygen renewal during composting, it has been decided to use 60% of this adsorption capacity for the windrow mixture preparation.

Second step

During the active phase of composting, the change of the temperature inside the two windrows is influenced by turning operations (Figure 1). The maximum temperature is higher (63°C) in W2 than in W1 (57°C). But finally in the two cases, the temperature falls towards the ambient temperature after 47 days. After a maturation of 60 more days, the compost production rates for W1 and W2 (Table 1) show a more intensive fermentation in the windrow receiving pig slurry addition.



Elements of the mass balance (kg)	W1 (with pig slurry addition)			W2 (without pig slurry addition)		
	Wastes in	Compost out	%	Wastes in	Compost out	%
Gross weight	4275	951	22	3120	1005	32
Dry matter	907	503	55	844	548	65
Organic carbon	298	74	25	275	77	28
Organic matter	536	188	35	495	198	40
Total nitrogen	11.4	4.7	41	12.5	4.6	37

Conclusion and prospects

In Wallis, the protection of ground water and lagoon against pollution due to the pig farms should proceed with a maximum valorization by spreading pig slurry on the accessible cultivated zones and a composting treatment for the surpluses. Green waste, constituting the only bulking material available, seems to be a good way. At medium term, the potential of pig slurry collection would account for 40,000 m3.y-1. The green waste needed will be around 15,000 tons.y-1 and it would be now advisable to check for their deposit flow rate fluctuations along the year. On the other hand, pig slurry collection has to be closely studied because of the high number of pig farms.

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French Agricultural Research Centre for International Development

Design and production: CIRAD - April 2005